

Metric Prefixes

(adapted from Russ Rowlett, *How Many? a Dictionary of Units of Measurement*, <http://www.unc.edu/~rowlett/units/prefixes.html>, accessed 7/10/15)

In your introductory chemistry and biology labs, you probably used only a few of the most common metric prefixes, such as milli-, centi-, and kilo-. Various textbooks and lab manuals contain longer lists of prefixes, but not many contain a complete list. There is no point in memorizing all of them, but it is nice to be able to look them up when you encounter them as you read the scientific literature. The smaller prefixes, such as nano-, pico- and femto-, are becoming increasingly common as analytical chemistry and biotechnology develop more sensitive methods. The larger prefixes, such as mega-, giga-, and tera-, are becoming more common in computing as engineers find ways to pack more and more memory into tiny devices. Table 1 presents prefixes ranging from 10^{24} to 10^{-24} . To help you visualize the effect of these prefixes, the column labeled “a sense of scale” gives some examples of the magnitudes represented.

Table 1. Metric Prefixes

Prefix	Abbreviation (note upper and lower case)	Meaning	Synonym	A sense of scale (approximate)
yotta-	(Y-)	10^{24}	1 septillion	Mass of water in Pacific Ocean ~1 Yg Energy emitted by sun per second ~400 YJ Volume of earth ~1 YL Mass of earth ~6000 Yg
zetta-	(Z-)	10^{21}	1 sextillion	Radius of Milky Way galaxy ~1 Zm Volume of Pacific Ocean ~1 ZL Annual world energy production ~0.4 ZJ
exa-	(E-)	10^{18}	1 quintillion	Age of universe (12 billion yr) ~0.4 Es
peta-	(P-)	10^{15}	1 quadrillion	1 light-year ~9.5 Pm
tera-	(T-)	10^{12}	1 trillion	Sun-to-Jupiter distance ~0.8 Tm
giga-	(G-)	10^9	1 billion	Human life expectancy ~3 Gs 1 light-second ~0.3 Gs
mega-	(M-)	10^6	1 million	Two weeks ~1.2 Ms
kilo-	(k-)	10^3	1 thousand	
hecto-	(h-)	10^2	1 hundred	
deka-	(da-)	10	1 ten	
deci-	(d-)	10^{-1}	1 tenth	
centi-	(c-)	10^{-2}	1 hundredth	
milli-	(m-)	10^{-3}	1 thousandth	
micro-	(μ -)	10^{-6}	1 millionth	Diameter of human ovum ~1 μ m Volume of mosquito blood meal ~2 μ L Volume of wood frog egg ~3 μ L
nano-	(n-)	10^{-9}	1 billionth	Radius of chlorine atom ~0.1 nm
pico-	(p-)	10^{-12}	1 trillionth	Mass of bacterial cell ~1 pg
femto-	(f-)	10^{-15}	1 quadrillionth	Radius of proton ~1 fm Volume of <i>E. coli</i> cell ~1 fL Volume of red blood cell ~100 fL
atto-	(a-)	10^{-18}	1 quintillionth	Time for light to cross an atom ~1 as Bond energy of C=C ~1 aJ
zepto-	(z-)	10^{-21}	1 sextillionth	600 atoms or molecules ~1 zmol
yocto-	(y-)	10^{-24}	1 septillionth	Mass of proton or neutron ~1.7 yg